We claim:

1. A method for hydrotreating hydrocarbons comprising:
   a. combining hydrogen containing gas with a liquid hydrocarbon stream containing heteroatoms to form a feed stream;
   b. passing said feed stream over a monolithic catalyst bed containing hydrotreating catalyst components;
   c. wherein the superficial liquid linear velocity of said feed stream is greater than about 0.02 cm/s and the one-pass conversion of a heteroatom is greater than 50%.

2. The method for hydrotreating hydrocarbons as described in claim 1, wherein the superficial liquid linear velocity is greater than about 0.2 cm/s.

3. The method for hydrotreating hydrocarbons as described in claim 1, wherein said monolithic catalyst bed has a honeycomb configuration.

4. The method for hydrotreating hydrocarbons as described in claim 1, wherein said heteroatoms are from a group consisting of sulfur, nitrogen, metals, and oxygen.

5. The method for hydrotreating hydrocarbons as described in claim 1, wherein said hydrotreating catalyst components are from the group of cobalt, molybdenum, nickel, tungsten, and phosphorous.

6. The method for hydrotreating hydrocarbons as described in claim 1, wherein said hydrotreating catalyst components are metals selected from Group VIII of the Periodic Table.

7. The method for hydrotreating hydrocarbons as described in claim 1 wherein the monolithic catalyst bed comprises one or more inorganic honeycombs comprising channel wall surfaces formed of an alumina-containing catalyst support material.

8. The method for hydrotreating hydrocarbons as described in claim 7 wherein the channel wall surfaces incorporate an alumina coating.

9. The method for hydrotreating hydrocarbons as described in claim 7 wherein the inorganic honeycombs are formed of alumina.

10. The method for hydrotreating hydrocarbons as described in claim 1 wherein the monolithic catalyst bed comprises one or more inorganic honeycombs comprising channel wall surfaces formed of a zeolite catalyst support material.

11. The method for hydrotreating hydrocarbons as described in claim 1, wherein said liquid hydrocarbon stream has a boiling range within the range of about 70 to about 700°C.

12. The method for hydrotreating hydrocarbons as described in claim 1, wherein the said liquid hydrocarbon stream is from a group of refinery streams consisting of distillates, gas oils, and gasoline blendstocks.

13. The method for hydrotreating hydrocarbons as described in claim 1, wherein the said liquid hydrocarbon stream is in the diesel fuel boiling range.

14. The method for hydrotreating hydrocarbons as described in claim 1, wherein the one-pass conversion of the targeted heteroatom is greater than 80%.

15. The method for hydrotreating hydrocarbons as described in claim 1, wherein the one-pass conversion of the targeted heteroatom is greater than 90%.

16. The method for hydrotreating hydrocarbons as described in claim 1, wherein the feed hydrogen gas to liquid feed volume ratio is greater than about 10 NL/L, the liquid hourly space velocity is greater than about 0.1 h^{-1}, the reactor pressure is greater than about 1 bar, and the reaction temperature is greater than about 200°C.

17. The method for hydrotreating hydrocarbons as described in claim 1, wherein the feed hydrogen gas to liquid feed volume ratio is greater than about 50 NL/L, the liquid hourly space velocity is greater than about 0.7 h^{-1}, the reactor pressure is greater than about 20 bar, and the reaction temperature is greater than about 250°C.

18. A method for making low-sulfur diesel fuel comprising:
    a. combining hydrogen-containing gas with a liquid hydrocarbon stream containing less than 3 wt % sulfur to form a feed stream;
    b. passing said feed stream over a monolithic catalyst bed containing hydrotreating catalyst components;
    c. separating the treated hydrocarbon effluent from the sour gas,
    d. wherein the separated, treated liquid hydrocarbon is a diesel fuel containing less than about 5000 wppm sulfur.

19. The method for making low-sulfur diesel fuel as described in claim 13, wherein said diesel fuel product contains less than about 15 wppm sulfur.

20. The method for making low-sulfur diesel fuel as described in claim 13, wherein said monolithic catalyst bed has a honeycomb configuration.

21. The method for making low-sulfur diesel fuel as described in claim 13, wherein said hydrotreating catalyst components are from the group of cobalt, molybdenum, nickel, tungsten, and phosphorous.

22. The method for making low-sulfur diesel fuel as described in claim 13, wherein the superficial liquid linear velocity is greater than about 0.02 cm/s, the feed hydrogen gas to liquid feed volume ratio is greater than about 10 NL/L, the liquid hourly space velocity is greater than about 0.1 h^{-1}, the reactor pressure is greater than about 1 bar, and the reaction temperature is greater than about 200°C.

23. The method for making low-sulfur diesel fuel as described in claim 17, wherein the feed hydrogen gas to liquid feed volume ratio is greater than about 50 NL/L, the liquid hourly space velocity is greater than about 0.7 h^{-1}, the reactor pressure is greater than about 20 bar, and the reaction temperature is greater than about 250°C.

24. The method for making low-sulfur diesel fuel as described in claim 17, wherein the superficial liquid linear velocity is greater than about 0.2 cm/s.

25. A method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity, comprising:
    a. combining hydrogen-containing gas with a liquid hydrocarbon stream containing heteroatoms to form a feed stream;
    b. passing said feed stream over a monolithic honeycomb catalyst bed containing hydrotreating catalyst components;
    c. said monolithic honeycomb catalyst bed having a cell density greater than about 10 cpsi and channel opening diameters greater than about 0.1 mm;
    d. wherein the superficial liquid linear velocity of said feed stream is greater than about 0.02 cm/s, the feed hydrogen gas to liquid feed volume ratio is greater than about 10 NL/L, the liquid hourly space velocity is greater than about 0.1 h^{-1}, the reactor pressure is greater than about 1 bar, and the reaction temperature is greater than about 200°C;
    e. and wherein the one-pass conversion of the targeted heteroatom is greater than 50% with comparable product and feed distillation points.

~~26. The method~~ increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating ~~selectivity as described~~ in claim 20, wherein said heteroatoms are from a group consisting of sulfur, nitrogen, metals, and oxygen.

27. The method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity as described in claim 20, wherein the superficial liquid linear velocity is greater than about 0.2 cm/s.

28. The method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity as described in claim 20, wherein the feed hydrogen gas to liquid feed volume ratio is greater than about 50 NL/L, the liquid hourly space velocity is greater than about 0.7 h^{-1}, the reactor pressure is greater than about 20 bar, and the reaction temperature is greater than about 250°C.

29. The method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity as described in claim 20,

wherein at least 70% (vol.) of the product stream has a D86 distillation temperature range falling within the D86 distillation range of the feedstock.

30. The method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity as described in claim 20, wherein said one-pass conversion of the targeted heteroatom is greater than 80%.

31. The method for increasing one-pass heteroatom conversion in a hydrotreating reactor while maintaining hydrotreating selectivity as described in claim 20, wherein said one-pass conversion of the targeted heteroatom is greater than 90%.

32. A monolithic hydrotreating catalyst comprising an inorganic honeycomb structure incorporating porous alumina-containing channel wall surfaces, the channel wall surfaces supporting a catalyst selected from the group consisting of molybdenum-containing and Group VIII-containing hydrotreating catalysts, the channel wall surfaces having an average BET surface area in the range of 10-400 m^2/gm and an average pore diameter in the range of 2-1000 nm, and the honeycomb structure having a catalyst void fraction in the range of 0.2-0.9.

33. A hydrotreating catalyst in accordance with claim 32 wherein the honeycomb structure is formed of alumina.

34. A hydrotreating catalyst in accordance with claim 32 wherein the channel wall surfaces of the honeycomb structure support an alumina coating.

35. A hydrotreating catalyst in accordance with claim 32 wherein the catalyst is a molybdenum-containing catalyst comprising at least one additional element selected from the group consisting of cobalt, tungsten, phosphorus and nickel.